

CONVERTING U.S. COAL INTO HIGH-VALUE PRODUCTS

The primary use of coal is for combustion processes that drive electricity generation, steel production and cement manufacturing. These processes represent low-value opportunities for U.S. coal and result in large emissions of CO₂. TerraPower is demonstrating technology that can convert—rather than burn—this abundant U.S. resource into high-value products suitable for transportation fuels, chemical industry feedstock and even advanced materials like carbon fiber.

TerraPower developed and operated a test loop for its unique coal conversion technology at its Everett, Washington, laboratory. Hot, pressurized CO₂ is used to break down coal molecules in an efficient manner. The CO₂ then carries these products away for collection while the CO₂ is recovered for continual reuse. Usable liquid products (similar in nature to crude oil) are generated along with solid carbon (char). The char is valuable as a cleaner, more energy dense product than the starting coal.

TerraPower's test loop created liquids to serve as a crude oil surrogate suitable for conventional refinery and chemical industry feedstock. This oil from coal is unique in that it carries heavier molecules suitable for creating advanced carbon materials. The process developed at TerraPower naturally separates these heavy molecules from the coal oils. This results in a higher value oil than generated by previous coal processing technologies while also creating a separate stream of heavier material suitable for solid carbon products such as low-cost carbon fiber.

Test Loop Parameters

12 MPa (1740 psi)

Peak temperature of 537°C

sCO₂ flows up to 12 kg/min

Multistage heat recuperation

In-house sample analysis



TerraPower's coal conversion test loop in Bellevue, WA

Testing at TerraPower focused on conversion of low-rank coals such as sub-bituminous coal from the United States' Powder River Basin and lignite from multiple U.S. locations. These are generally the cheapest, lowest energy density coals, all of which can be used to create high-value solid and liquid products.

As TerraPower aims to make the technology more affordable and less impactful to the environment, it will explore collaboration with interested parties. TerraPower anticipates scaling up the current test loop in pursuit of commercial demonstration.

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